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The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

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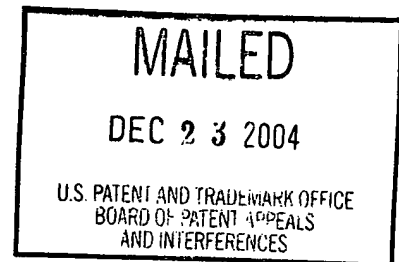
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TADATOMO SUGA

Appeal No. 2004-0651
Application No. 09/898,082

HEARD: December 9, 2004



Before KRASS, DIXON and BLANKENSHIP, Administrative Patent Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1, 3-9 and 20-24.

The invention is directed to a semiconductor device. In particular, it is said that the device is capable of achieving a reliable electrical connection by securely directly bonding conductors to each other even though their bonding surfaces are

Appeal No. 2004-0651
Application No. 09/898,082

subjected to chemical mechanical polishing (CMP), by forming a structure as recited in representative independent claim 1, reproduced as follows:

1. A semiconductor device comprising:

a first portion comprising a first substrate, a conductive layer and an insulating layer laminated on the first substrate and a bonding surface that is chemically mechanically polished and exposes a conductive region and an insulating region, wherein the conductive region includes a concave surface defining a dishing portion;

a second portion comprising a second substrate, a conductive layer and an insulating layer laminated on the second substrate and a bonding surface that is chemically mechanically polished and exposes at least a conductive region having a concave surface defining a dishing portion; and wherein

the bonding surface of the first portion and the bonding surface of the second portion are solid-state-bonded to each other so that the dishing portions of the conductive regions of the respective first and second portions are bonded to each other so as to contact one another; and

at least one of the bonding surface of the first portion and the bonding surface of the second portion has the insulating region lowered with respect to the conductive region.

The examiner relies on the following reference:

Kawai et al. (Kawai) 5,939,789 Aug. 17, 1999

Claims 1, 3-9 and 20-24 stand rejected under 35 U.S.C.
§ 102(b) as anticipated by Kawai.

Reference is made to the briefs and answer for the respective positions of appellant and the examiner.

OPINION

A rejection for anticipation under section 102 requires that the four corners of a single prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation. In re Paulsen, 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).

The examiner, at pages 3 et seq. of the answer, sets forth the correspondence between the disclosure of Kawai and the instant claimed elements.

While appellant does not disagree with every part of the examiner's correspondence, appellant does argue, with regard to claim 1, that Kawai differs therefrom in that the Cu material which fills holes 4 in Kawai does not have a dishing portion, i.e., no concave shaped surface. Further, appellant argues, Kawai's Sn bonding members 5 and metal wirings 2 in Figure 12 (c) also have no concave dishing portions on respective surfaces thereof.

While the examiner does not contend that Kawai does disclose concave dishing portions, the examiner does contend that

the so-called concave shaped surface defining a dishing portion only exists in the intermediate step of the bonding process as shown in figure 3 of the instant

Appeal No. 2004-0651
Application No. 09/898,082

application. When the two portions are solid stated bonded to each other, the concave shaped surface defining a dishing portion is no longer in the final product as disclosed in figure 4 of the instant application. Since the claim appears to be defining a final product, the concave shaped surface defining a dishing portion does not structurally distinguish over Kawai (answer-page 9).

Appellant agrees that the final product recited by instant claim 1 need not have the claimed concave dishing portions (principal brief-page 11). However, appellant contends that one cannot simply ignore this claim limitation, under the product-by-process rule, because the dishing portions are positively recited limitations which lead to unobvious differences in the final product and because the skilled artisan can tell from examination of the final product whether the dishing portions were used in the process of manufacture (principal brief-page 12). Appellant cites In re Swirbel, 2002 WL 1801019, Appeal No. 2000-0314 (BPAI 2002) and In re Marosi, 710 F.2d 799, 802, 218 USPQ 289, 292-93 (Fed. Cir. 1983).

Determination of patentability in "product-by-process" claims is based on the product itself, even though such claims are limited and defined by a process, and thus the product in such claims is unpatentable if it is the same as, or obvious from, a product of the prior art, even if the prior product was

Appeal No. 2004-0651
Application No. 09/898,082

made by different process. It is not error to affirm an examiner's rejection of "product-by-process" claims, absent proof by applicant that prior art products do not necessarily or inherently possess characteristics of his claimed product. In re Thorpe, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985).

As we view the record, there is no disagreement as to the final product not needing to have the claimed concave dishing portions because the finished product will not exhibit such concave dishing portions. The question, however, is whether the claimed "dishing portion" must be considered. They, in fact, must be considered as traditional product characteristics to the extent that these "process limitations" distinguish the finished product over the product disclosed by Kawai. In re Hallman, 655 F.2d 212, 210 USPQ 609 (CCPA 1981).

However, in accordance with the examiner's explanation as to how the elements of Kawai correspond to the instant claimed elements, it seems that the Kawai product would reasonably appear to be identical to the presently claimed product in product-by-process claim 1. Therefore, the examiner's rejection would appear to be fair because the PTO is not equipped to manufacture products by a myriad of processes put before it and then obtain

Appeal No. 2004-0651
Application No. 09/898,082

prior art products and make physical comparisons therewith. In re Brown and Saffer, 450 F.2d 531, 173 USPQ 685 (CCPA 1972).

Where a product-by-process claim is rejected over a prior art product that appears to be identical, although produced by a different process, the burden is upon applicants to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 799, 802, 218 USPQ 289, 292-93 (Fed. Cir. 1983).

Thus, the question comes down to whether appellant has met his burden of proof in establishing that the product made by the product-by-process claim 1 results in some discernible, or unobvious, difference over the Kawai product. Arguments of counsel cannot take the place of evidence. In re DeBlauwe, 736 F.2d 699, 222 USPQ 191 (Fed. Cir. 1984).

While counsel for appellant argues that the claimed dishing portions result in unobvious differences and advantages over the cited prior art, particularly in "higher reliability electrical connection of the conductive regions" (principal brief-page 12) and "stresses in the resulting final product" (principal brief-page 12), the record does not reflect any objective evidence in this regard. Appellant also argues that an "examination of the final product will indicate whether the claimed dishing portions

Appeal No. 2004-0651
Application No. 09/898,082

were used in making the product" (principal brief-page 12).

Specifically, counsel for appellant points out that

In the final product, peripheral and central parts of solid state bonded dishing portions are different in strain and texture due to the difference between deformation rates of the central and peripheral parts of the dishing portions. In the final product, the strain is concentrated in the peripheral parts of the bonded dishing portions, and thus the peripheral parts of the dishing portions are *more strongly bonded*. This clearly represents an unexpected and unobvious difference with respect to the prior art (principal brief-pages 12 and 13).

While a showing of these argued differences may be sufficient to overcome the examiner's rejection of product-by-process claim 1, appellant has offered no objective evidence enabling us to make an independent evaluation as to the resulting stronger bond, or difference in strain and texture. Since arguments of counsel cannot take the place of evidence, and, in our view, the examiner has made a reasonable showing that the product of instant claim 1 is reasonably identical to the Kawai product, we will sustain the rejection of claim 1 under 35 U.S.C. § 102(b). In accordance with appellant's grouping of claims, at page 1 of the reply brief, claims 3, 4, 7 and 9 will fall with claim 1.

Appeal No. 2004-0651
Application No. 09/898,082

With regard to claim 5, this claim requires that "the insulating region of the first portion and the insulating region of the second portion are put in contact with or solid-state-bonded to each other." Appellant contends that Kawai fails to disclose or suggest this limitation as, in Figure 12(c), Kawai shows insulators 1 are not in contact with one another, or solid-state-bonded to one another.

Since the "in contact with or solid-state-bonded" is recited in the alternative, only one need be shown in the prior art to meet the claim language. We agree with the examiner that the two insulator regions 1 of the first and second portions are, indeed, "in contact with" one another via bonding member 9 and frame 10. While appellant takes issue with this position because there is no *direct* contact between the insulators, we point out that the claim does not require such *direct* contact and does not preclude other intermediate elements between the insulators forming the contact. If appellant intended that there be direct contact with no intermediate elements therebetween, the claim could easily have been drafted to recite such.

Accordingly, we will sustain the rejection of claim 5 under 35 U.S.C. § 102(b).

Appeal No. 2004-0651
Application No. 09/898,082

With regard to claim 6, this claim requires that the insulating region that surrounds the conductive region of the first portion and the insulating region that surrounds the conductive region of the second portion are put in contact with or solid-state-bonded to each other.

For reasons similar to those supra, with regard to claim 5, we find that the insulating regions in Kawai are, indeed, in contact with each other, albeit through an intermediate element.

Thus, we also will sustain the rejection of claim 6, and claim 8 in accordance with appellant's grouping at page 2 of the reply brief, under 35 U.S.C. § 102(b).

Turning now to independent claim 20, the examiner points out the correspondence between the claimed subject matter and that disclosed by Kawai at pages 5-6 of the answer, and the examiner's rationale appears reasonable to us.

Appellant argues that the claim requires the first conductive material filling in the contact hole in the first insulating layer to be *protruding above* a surface of the first insulating layer, and also that the first and second conductive material fillings in the contact holes *contact one another*. Appellant contends that these features are not disclosed or suggested by Kawai.

Appeal No. 2004-0651
Application No. 09/898,082

First, appellant argues that the conductive filling material 4 in the first and second portions of Kawai (Figure 12(c)) do not contact each other. We disagree. These conductive filling materials do contact each other, via bonding member 5 and wiring 2 and this type of "contact" is not precluded by the instant claims. The instant claims do not require a *direct* contact with no intervening elements.

Next, appellant argues that the "protruding above" limitation of claim 20 is not shown or suggested in Kawai. Again, we disagree. Bonding member 5, a conductive material, may be considered as a protruding portion of conductive filling material 4 in Figure 12(c) of Kawai. While appellant contends that since material 5 is tin and material 4 is copper, material 5 may not be considered a protrusion of material 4, this describes only one embodiment of Kawai.

Kawai suggests, at column 7, lines 13-14, that bonding member 5 is made of a "metal or an alloy." Since there is no indication that material 5 and material 4 cannot be, or should not be, the same material, the artisan would have recognized, from Kawai's disclosure, that both materials may be copper, for example. The only requirement in Kawai is that both materials be

Appeal No. 2004-0651
Application No. 09/898,082

conductive and that the bonding member be made of "metal or an alloy." Accordingly, we find that Kawai does show the claimed protrusion and we will sustain the rejection of claim 20, and, in accordance with appellant's grouping at page 1 of the reply brief, the rejection of claims 22 and 24, under 35 U.S.C. § 102(b).

With regard to claim 21, this claim requires the second conductive material filling in the second insulating layer to protrude above a surface of the second insulating layer.

Appellant argues that "it cannot be said that Sn bonding members 5 meet this aspect of claim 20, because Sn bonding members 5 are not the material filling a contact hole as required by claim 21 (Sn and Cu are different materials)" (principal brief-page 8).

Since appellant is making exactly the same argument for claim 21 as he did for claim 20, and we have already found that claim 20 was properly rejected under 35 U.S.C. § 102(b), rejecting appellant's argument in this regard, we will sustain the rejection of claim 21 under 35 U.S.C. § 102(b) for the same reasons.

Claim 23 requires concave surfaces of respective first and second conductive materials to be bonded to one another so as to

Appeal No. 2004-0651
Application No. 09/898,082

Claim 23 requires concave surfaces of respective first and second conductive materials to be bonded to one another so as to contact each other.

Appellant points to Figure 3 of the instant application, elements 5 and 25, arguing that these surfaces are concave in shape before bonding but need not be concave in shape after bonding. We agree with the examiner that the concave surfaces form only a part of an intermediate step of the bonding process. But, the claim is directed to the finished product and, for the reasons supra, appellant has not adequately shown that the finished product distinguishes over the end structure of Kawai. Thus, we will sustain the rejection of claim 23 under 35 U.S.C. § 102(b).

We have sustained the rejection of claims 1, 3-9 and 20-24 under 35 U.S.C. § 102(b).

Accordingly, the examiner's decision is affirmed.

Appeal No. 2004-0651
Application No. 09/898,082

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